

# DC / DC converter for LCDs

## BP5319 / BP5319X

The BP5319 and BP5319X are DC / DC converters for supplying power to liquid crystal displays (LCDs) panels. These modules supply a negative voltage from power supply of 5V. They are available in a single in-line package as an upright (BP5319) or L-shaped lead (BP5319X) type.

### ● Applications

LCD panels in copiers, facsimiles, personal computers, word processors, instruments, and other displays

### ● Features

- 1) Accurate output voltage. ( $-24V \pm 0.75V$ )
- 2) High conversion efficiency. (typically 75%)
- 3) The external resistor can change an output voltage.
- 4) Built-in protection circuit.
- 5) Built-in ON/OFF switch.
- 6) Compact and light.
- 7) Available as an upright or L-shaped lead type.

### ● Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit
Input voltage	V <sub>IN</sub>	7	V
Output current	I <sub>o</sub>	30	mA
ON / OFF CTL voltage	V <sub>CTL</sub>	7	V
Operating temperature range	T <sub>opr</sub>	-10~+60	°C
Storage temperature range	T <sub>stg</sub>	-30~+85	°C

### ● Pin descriptions

Pin No.	Pin name	Function
1	Co	Output smoothing capacitor connection pin; connect a low-impedance capacitor with a recommended capacitance of 47 $\mu$ F between this pin and GND.
2	V <sub>OUT</sub>	Output pin
3	V <sub>ref</sub>	Output voltage adjustment pin for contrast; output voltages is adjusted by connecting a resistor between pins 2 and 3 or pins 3 and 4.
4, 7	GND	Ground pin; pins 4 and 7 are internal connection.
8	V <sub>CTL</sub>	Output ON / OFF control pin; output starts when the pin is LOW level or OPEN, and stops when the pin HIGH level.
9	V <sub>IN</sub>	Input pin; connect a low-impedance capacitor with a recommended capacitance of 100mF between this pin and GND.

### ● Electrical characteristics (Unless otherwise noted, Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input voltage	V <sub>IN</sub>	4.5	–	5.5	V	
Output current	I <sub>OUT</sub>	–	–	30	mA	
Output voltage	V <sub>OUT</sub>	–24.75	–24.00	–23.25	V	V <sub>IN</sub> =5V, I <sub>OUT</sub> =25mA
Line regulation	$\Delta V_1$	–	–	0.24	V	V <sub>IN</sub> =4.5~5.5V, I <sub>OUT</sub> =25mA
Load regulation	$\Delta V_2$	–	–	0.24	V	V <sub>IN</sub> =5V, I <sub>OUT</sub> =0~25mA
Output voltage temperature coefficient	$\Delta V_t$	–	–10	–	mV / °C	V <sub>IN</sub> =5V, I <sub>OUT</sub> =25mA *2
Ripple noise voltage	v <sub>1</sub>	–	–	150	mV <sub>PP</sub>	V <sub>IN</sub> =5V, I <sub>OUT</sub> =25mA *1
Conversion efficiency	$\eta$	70	75	–	%	V <sub>IN</sub> =5V, I <sub>OUT</sub> =25mA
ON / OFF CTL voltage when OFF	V <sub>CTL</sub>	2.0	–	–	V	V <sub>IN</sub> =5V
ON / OFF CTL voltage when ON	V <sub>CTL</sub>	–	–	0.5	V	V <sub>IN</sub> =5V (Alternatively, when Open)
ON / OFF CTL input current	I <sub>CTL</sub>	–	100	150	$\mu$ A	V <sub>IN</sub> =4.5~5.5V, V <sub>CTL</sub> =5V *2
Current consumption when OFF	I <sub>OFF</sub>	–	–	0.5	mA	V <sub>IN</sub> =4.5~5.5V, V <sub>CTL</sub> =5V *2
R1 resistance	R1	50	–	$\infty$	k $\Omega$	V <sub>IN</sub> =4.5~5.5V, V <sub>CTL</sub> =5V *2
R2 resistance	R2	50	–	$\infty$	k $\Omega$	V <sub>IN</sub> =4.5~5.5V, V <sub>CTL</sub> =5V *2

\*1 Measured with a bandwidth of 20MHz.

\*2 Ta=–10~60°C

● Measurement circuit

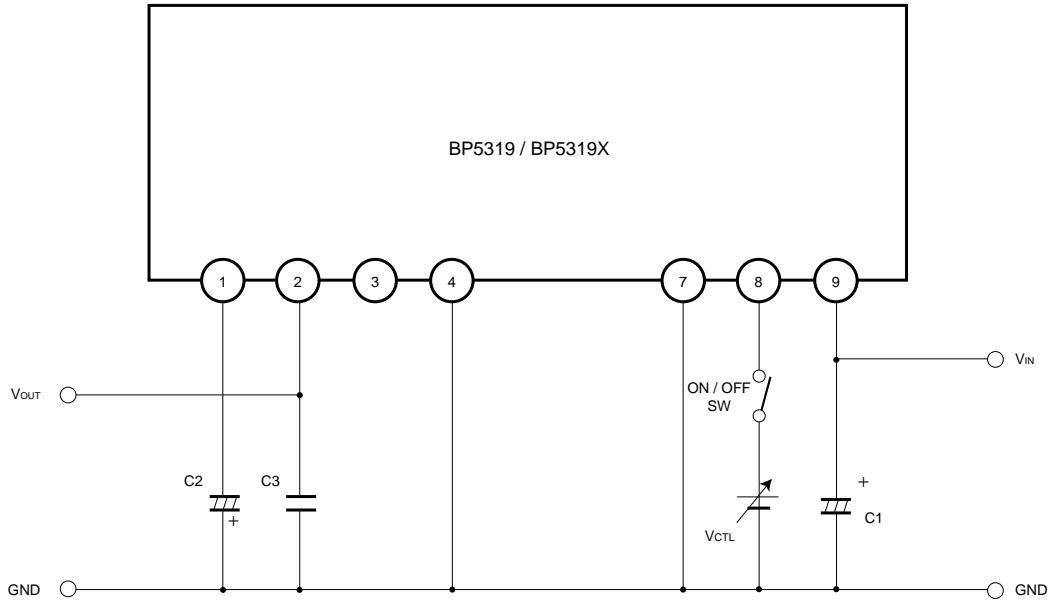
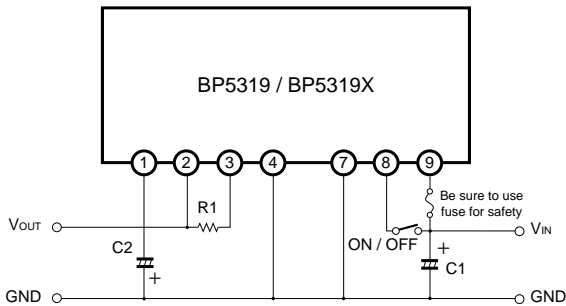


Fig.1

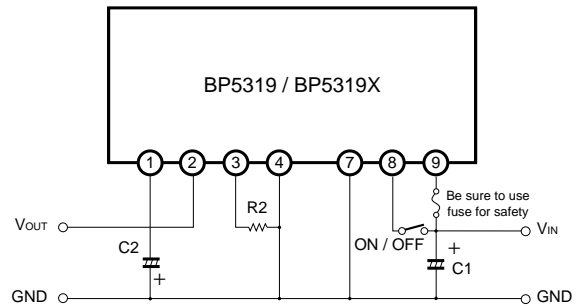
- C1 : 100 $\mu$ F / 16V (Low-impedance capacitor)
- C2 : 47 $\mu$ F / 35V (Low-impedance capacitor)
- C3 : 0.022 $\mu$ F / 50V (Ceramic capacitor)

● Application example

(1) When increasing the output voltage (to negative voltage side)



(2) When reducing the output voltage (near to zero voltage)



Note) Set up the change of the output voltage in the range of the territory(Fig.2) which can be used.

● Operation notes

- (1) Place I/O external capacitors as near as possible to the connection pins. In particular, make sure to minimize the impedance between the input-side capacitor (C1) and pin 9. (Reference value: A length less than 50mm is recommended for a copper foil of 1.0mm wide and 35 $\mu$ m thick.)
- (2) Avoid frequent switching using the ON / OFF CTL pin (5 times per second at the maximum).

● Electrical characteristic curves

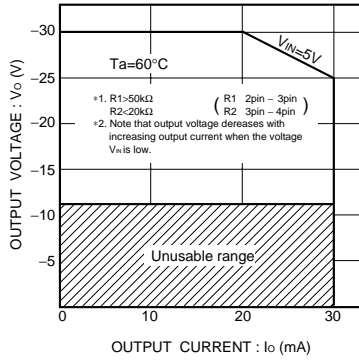


Fig.2 Usable range

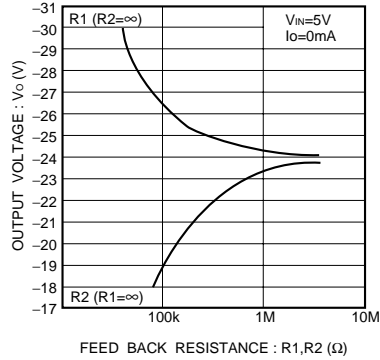


Fig.3 Output voltage vs. Feedback resistance (R1, R2)

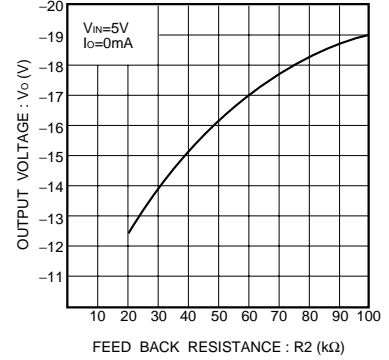
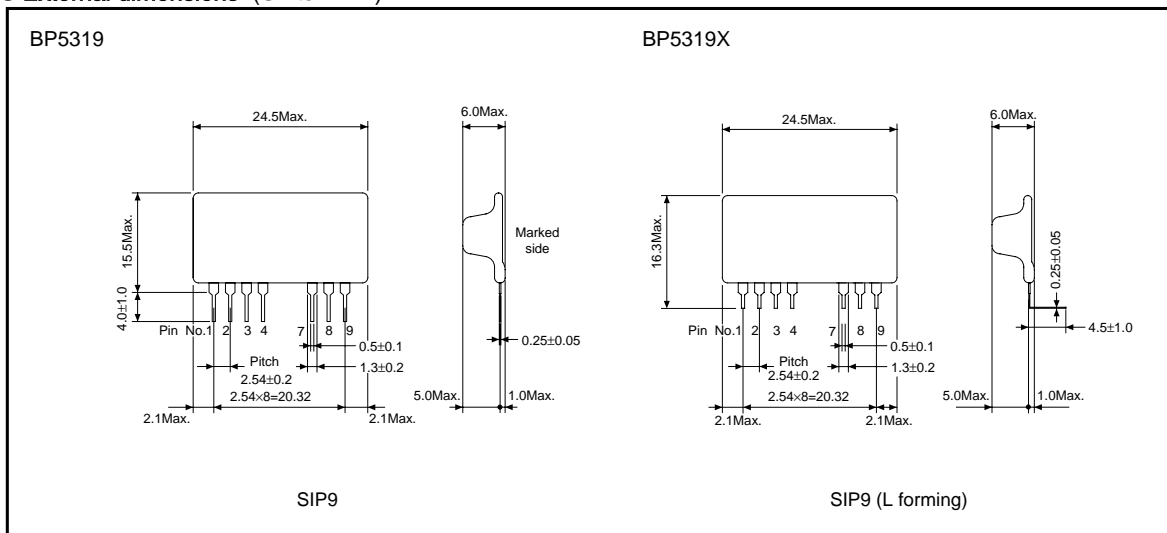


Fig.4 Output voltage vs. Feedback resistance (R2<100kΩ)

● External dimensions (Units : mm)



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